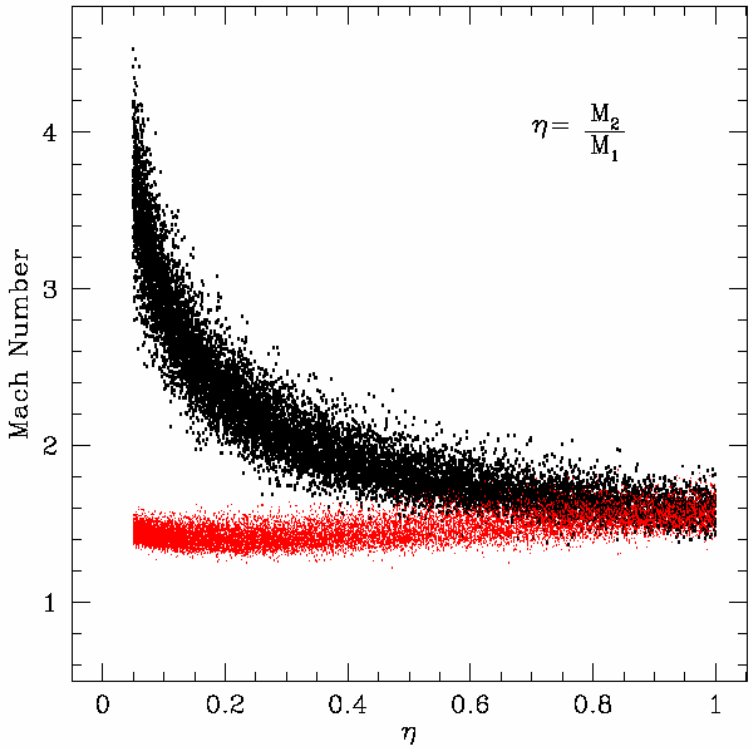
Working Group 1 – Extended Sources and Diffuse Radiation

- **Wednesday, 14 attendees**
- **Blasi, *Recent theoretical results on high-energy emission from galaxy clusters***
  - **The intercluster medium acts as a cosmic-ray storage container, especially for protons**
  - **Clusters of galaxies form by mergers, and the cosmic rays in storage reflect the merger history**
  - **'Major mergers' are the most energetic 'events' anywhere (10^{64} ergs in 10^{9} yrs)**
  - **Still, simulations of merger buildup of clusters find that the shocks are not strong (except in case of very unequal masses) & indicate that clusters have soft gamma-ray spectra**
  - **Some clusters (and merging clusters) are likely to be LAT point sources**
  - **Conservatively, cluster mergers represent < 10% of the EGRB**



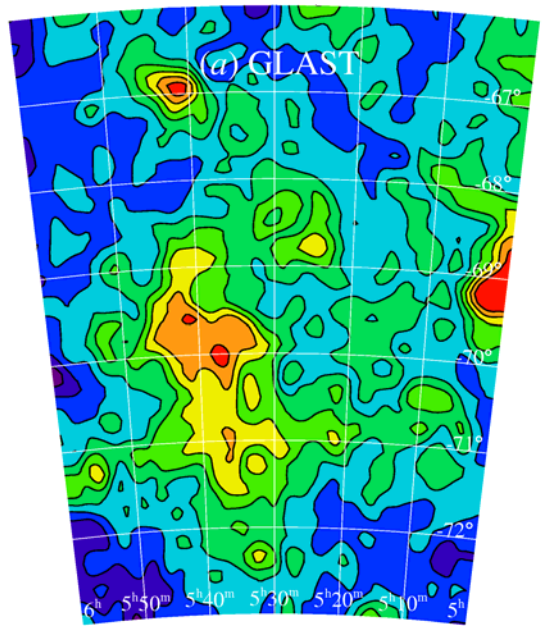
Gabici & Blasi (2002)

WG 1 – Science updates, cont.

- Reimer, *Results from EGRET on gamma-ray emission of clusters*
  - Recently published studies have claimed associations of unidentified EGRET sources with galaxy clusters, or 'possibly merging' clusters, or ~3 σ statistical detection of high-energy γ-ray emission from an inhomogeneous population of 447 clusters
  - Reimer: Largest likelihood analysis yet of EGRET data using stacked, centered counts and exposure maps for 58 X-ray brightest, nearest clusters (and corresponding reprojected effective diffuse emission model) yields total exposure of 3.5×10^{-10} cm^2 s, and upper limit of ~6×10^{-9} cm^{-2} s^{-1} >100 MeV

WG 1 – Science updates, cont.

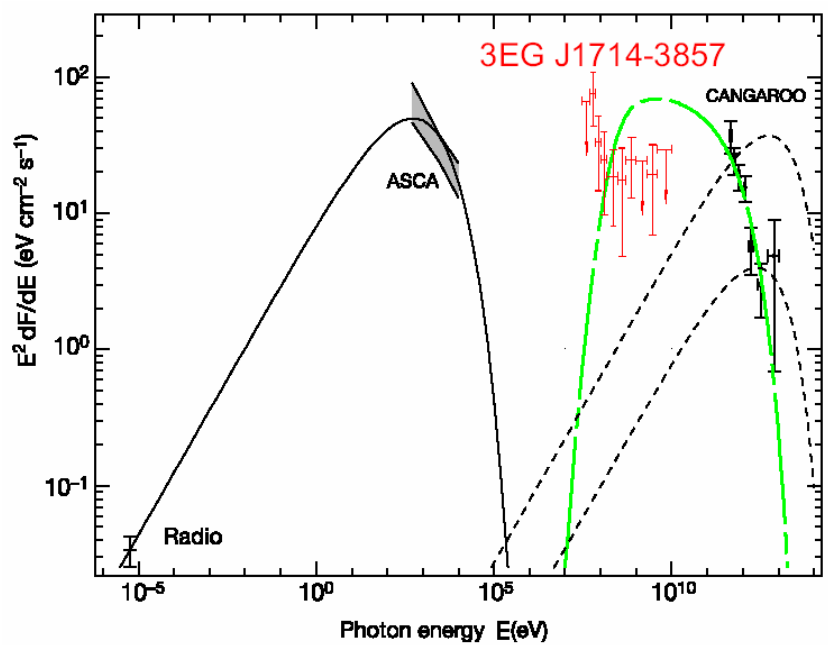
- **Digel, *Diffuse gamma-ray emission from external galaxies***
  - **'Normal' taken to include starburst galaxies**
  - **Summarized the limited literature on estimating fluxes of diffuse emission, and the even more limited list of EGRET detections**
  - **Expected LAT detections are also limited, although LMC and SMC each ought to be resolved, and M31 have a good spectrum measured**
  - **Nearest SBGs (M82, NGC 253) ought to be detected**
  - **A recently published work on contribution of normal galaxies to EGRB is interesting, although it should not be the last word on the subject**



Simulated >100 MeV map from LAT sky survey, based on LMC model by Sreekumar (priv. comm.) & including Galactic foreground and blazar background

WG 1 – Science updates, cont.

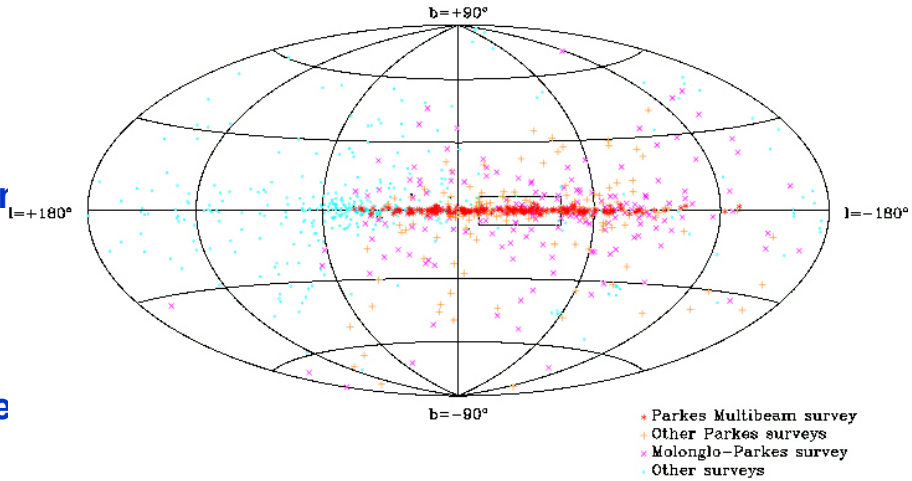
- **Pohl, *Interpretation of gamma-ray emission from SNR RX J1713.7-3946***
  - **Recently detected as a TeV source**
  - **Together with radio continuum flux and ASCA X-ray spectrum, had been claimed that the TeV emission could not be IC, and was evidence of proton component of CRs**
  - **Counter evidence is that the associated EGRET point source has a spectrum inconsistent with this interpretation; synchrotron spectrum needs more data points**



Reimer & Pohl (2002)

WG 1 + 2, Science Updates

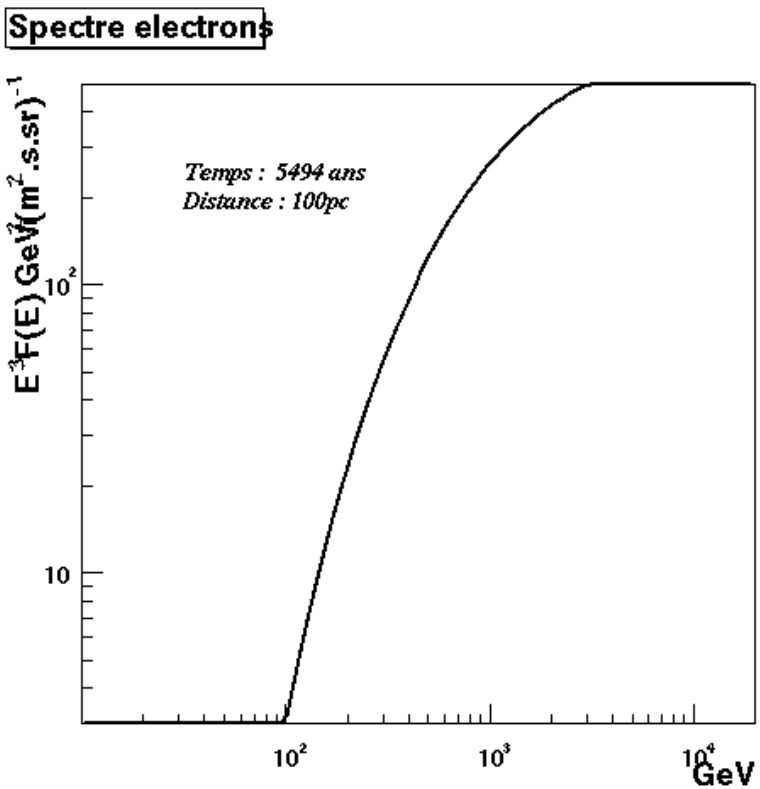
- Thursday, 27 attendees for joint session WG 1 + WG 2
- Harding, *Pulsar searches in EGRET error boxes*
  - Parkes multibeam survey has detected 775 new radio pulsars, ~tripling # of pulsars known
  - 27 newly-discovered pulsars (this survey and Arecibo deep) are within EGRET error boxes
  - Distribution of pulsar properties (spin down age, luminosities from new Cordes & Lazio dispersion measure model) shows many consistent with EGRET-detected pulsars
  - Retrospective pulsation searches are not feasible in the EGRET data, but population of candidates for monitoring during GLAST mission has been increased
  - Green Bank multibeam survey in the north is underway or soon will be



ATNF

WG 1 + 2, Science Updates

- Grenier, *Sources and propagation of TeV electrons*
  - Work of R. Terrier on production of TeV electrons in SNR and detection by LAT
  - Cuts to distinguish protron showers from e-m showers
  - Strong anisotropy is expected for TeV electrons; Vela and Cygnus Loop are too young, leaving Loop I and Monogem as prospective sources



Terrier (2002)

WG 1 + 2, Interstellar emission model

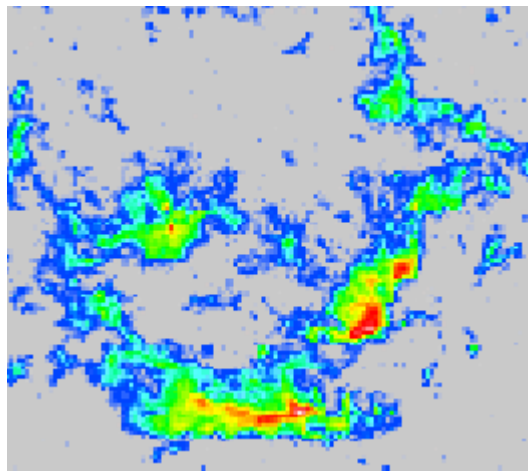
- Hunter, *Considerations from GMULT & GBIAS maps from EGRET analysis*
  - Diffuse emission model local scale and offset factors for EGRET likelihood analysis
  - Anticorrelated, especially at high latitudes (and in GC region)
  - Lesson to be learned, once we figure it out; at least suggests that more orthogonal parameters could be used for LAT analysis
- Moskalenko, *GALPROP: Recent development and results*
  - Cosmic rays (including heavies), gas, interstellar radiation field, nuclear reactions, sources and propagation of cosmic rays (optionally 3-dimensional), calculation of gamma-ray fluxes
  - Showed preliminary new result for EGRB
  - Future work is anticipated on gas model & ISRF

WG 1 + 2, Interstellar emission model, cont.

- Grenier, *Interdisciplinary meeting for evaluating the gas and radiation distributions in the Milky Way*
  - We plan to invite (coerce) experts in radio (cm, mm, submm) surveys, IR (MAP?) data, stellar populations to a workshop in mid-2003, to make sure
- Coordinate representation for the interstellar emission model
  - Likely to be different from the one that is useful for generating the model
  - Avoid poles?

WG 1+2, Observation simulator modules

- **Building blocks (in addition to the interstellar emission model)**
  - **Point sources of various kinds**
    - **Pulsars, plerions, binary pulsars, microquasars, starburst galaxies, galaxy clusters**
    - **We need flexible specification of spectra**
    - **A serious challenge is likely to be pulsars and binary pulsars: getting the timing right, allowing phase-dependent spectra,…[O2 will have to make arrival time corrections]**
  - **Small extended sources**
    - **Flexible specification of spectrum**
    - **Also flexible specification of distribution on the sky via 'template' maps**



Orion A&B Molecular Cloud Complex
Dame et al. (2001)
115 GHz CO

Working Group 1 – Extended Sources and Diffuse Radiation

- **Wednesday, October 23**

1:45-4:00 Scientific updates – WG 1

Blasi	Recent theoretical results on high-energy emission from galaxy clusters	25’
Reimer	Results from EGRET on gamma-ray emission from galaxy clusters	25
Digel	Diffuse gamma-ray emission from external galaxies	25
Moskalenko	GALPROP: Recent development and results	25
Pohl	Interpretation of gamma-ray emission from SNR RX J1713.7-3946	10

- **Thursday, October 24**

8:45-9:45 Scientific updates – WG 1 + WG 2

Harding	Pulsar searches in EGRET error boxes	25’
Grenier	Sources and propagation of TeV electrons	25

WG 1 Agenda (2)

- **Thursday, October 24**

9:45-12:00 Science Tools Discussion WG 1 + WG 2

Interstellar emission model

Hunter	Considerations from GMULT & GBIAS maps from EGRET analysis	10’
Grenier	Interdisciplinary meeting for evaluating the gas and radiation distributions in the Milky Way	10
All	Discussion of issues	40
Break		15

Observation simulator modules

All	Discussion of issues	60